Carleton Update on LC TPC Readout Studies

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Current Activities & Plans

• Continue mini-TPC cosmic ray test analysis for longitudinal track fit
• Continue double GEM charge dispersion studies
• Micromegas with a resistive anode for charge dispersion studies
  – Collaborators: Paul Colas (Saclay) & Vincent Lepeltier (Orsay)
  – First observation of charge dispersion signals in a Micromegas
  – Continue Micromegas charge dispersion studies in collaboration with Saclay/Orsay
• Modify mini-TPC for cosmic & beam tests with a resistive anode MPGD readout
  – New 128 channel endcap will replace the existing 64 channel motherboard
  – 64 additional channels of 200 MHz FADCs received from U. Montreal
  – DAQ development in progress
Double GEM charge dispersion studies

- Concept feasibility has been demonstrated with 2.5 M-Ohm/sq foil
- Pad response was too narrow with 2.5 M-Ohm foil
- New 1 M-Ohm/sq resistive anode foil installed for more reasonable PRF
  - First tests show reasonable PRF width
  - Continue resolution studies with long strips and hex pads
  - Complete charge dispersion tests with realistic 2 mm x 6 mm pad readout geometry
A resistive anode Micromegas for charge dispersion

- Collaborators: Paul Colas (Saclay) & Vincent Lepeltier (Orsay)
- 1 M-Ohm/sq foil with readout identical to GEM test cell
- Copper micromesh pre-stretched on a frame fabricated by CERN
- Micromegas gap ~ 130 µm (fish line @ 3 mm spacing)
- $^{55}$Fe collimated source for primary ionization
- Observe first Micromegas charge dispersion signals with anode strips and hexagonal pads
- 130 µm not ideal for P10 (argon optimum ~ 30 µm) leads to gain sensitive to gap non-uniformity
Resistive anode Micromegas for charge dispersion

Drift plane gap = 6.4 mm

Copper micromesh

130 μm fish line, spacing 3 mm

1 M-Ohm/sq 50 μm resistive film
50 μm adhesive
Readout pad PCB
Charge dispersion signal on 2.5 mm wide x 7 cm long readout pads
Ionization spot size ~ 700 µm centred on strip 3 (collimated Fe55 source)
Single event - Micromegas read out with 2.5 mm hex pads
Ionization spot size ~ 700 µm centred on pad 9
Observed charge dispersion signal on pads 9, 7 and 5
(direct charge, first neighbor & next neighbor dispersion signals)
Micromegas read out with 2.5 mm hexagonal pads
Ionization spot ~ 700 µm spot at corner of pads 7, 9 & 12
Signals observed on pads 12, 4 & 10
(Direct charge, far neighbor and near neighbor)